1. Perform the division below. Then, find the intervals that correspond to the quotient in the form $ax^2 + bx + c$ and remainder r.

$$\frac{10x^3 - 42x^2 + 37}{x - 4}$$

A. $a \in [7, 15], b \in [-89, -81], c \in [325, 333]$, and $r \in [-1276, -1272]$.

B. $a \in [7, 15], b \in [-3, 2], c \in [-8, -4]$, and $r \in [4, 9]$.

C. $a \in [7, 15], b \in [-15, -10], c \in [-38, -35]$, and $r \in [-74, -67]$.

D. $a \in [38, 46], b \in [117, 128], c \in [472, 476]$, and $r \in [1924, 1933]$.

E. $a \in [38, 46], b \in [-204, -197], c \in [808, 817]$, and $r \in [-3200, -3192]$.

---

2. What are the *possible Integer* roots of the polynomial below?

$$f(x) = 3x^4 + 6x^3 + 6x^2 + 3x + 6$$

A. $\pm 1, \pm 3$

B. $\pm 1, \pm 2, \pm 3, \pm 6$

C. All combinations of: $\dfrac{\pm 1, \pm 3}{\pm 1, \pm 2, \pm 3, \pm 6}$

D. All combinations of: $\dfrac{\pm 1, \pm 2, \pm 3, \pm 6}{\pm 1, \pm 3}$

E. There is no formula or theorem that tells us all possible Integer roots.

---

3. Perform the division below. Then, find the intervals that correspond to the quotient in the form $ax^2 + bx + c$ and remainder r.

$$\frac{15x^3 - 33x^2 - 96x - 50}{x - 4}$$

A. $a \in [14, 16],\ b \in [24, 34],\ c \in [12, 16]$, and $r \in [-9, 0]$.

B. $a \in [57, 64],\ b \in [207, 214],\ c \in [728, 736]$, and $r \in [2878, 2879]$.

C. $a \in [14, 16],\ b \in [-97, -88],\ c \in [275, 283]$, and $r \in [-1160, -1151]$.

D. $a \in [14, 16]$, $b \in [11, 15]$, $c \in [-65, -59]$, and $r \in [-230, -226]$.

E. $a \in [57, 64]$, $b \in [-277, -269]$, $c \in [996, 1002]$, and $r \in [-4037, -4026]$.

---

4. Factor the polynomial below completely, knowing that $x+5$ is a factor. Then, choose the intervals the zeros of the polynomial belong to, where $z_1 \leq z_2 \leq z_3 \leq z_4$. *To make the problem easier, all zeros are between -5 and 5.*

$$f(x) = 15x^4 + 29x^3 - 233x^2 + 3x + 90$$

A. $z_1 \in [-4, 1]$, $z_2 \in [-1.52, -1.5]$, $z_3 \in [1.55, 1.68]$, and $z_4 \in [4, 8]$

B. $z_1 \in [-7, -4]$, $z_2 \in [-1.72, -1.66]$, $z_3 \in [1.46, 1.55]$, and $z_4 \in [1, 4]$

C. $z_1 \in [-7, -4]$, $z_2 \in [-0.62, -0.57]$, $z_3 \in [0.64, 0.75]$, and $z_4 \in [1, 4]$

D. $z_1 \in [-4, 1]$, $z_2 \in [-0.15, -0.04]$, $z_3 \in [2.95, 3.07]$, and $z_4 \in [4, 8]$

E. $z_1 \in [-4, 1]$, $z_2 \in [-0.67, -0.65]$, $z_3 \in [0.55, 0.64]$, and $z_4 \in [4, 8]$

---

5. Factor the polynomial below completely. Then, choose the intervals the zeros of the polynomial belong to, where $z_1 \leq z_2 \leq z_3$. *To make the problem easier, all zeros are between -5 and 5.*

$$f(x) = 10x^3 + 9x^2 - 28x - 12$$

A. $z_1 \in [-3.33, -2.61]$, $z_2 \in [-0.02, 0.32]$, and $z_3 \in [1.78, 2.21]$

B. $z_1 \in [-2.82, -2.12]$, $z_2 \in [-2.05, -1.75]$, and $z_3 \in [0.04, 0.93]$

C. $z_1 \in [-2.38, -1.94]$, $z_2 \in [-0.71, -0.38]$, and $z_3 \in [1.45, 1.66]$

D. $z_1 \in [-0.73, -0.52]$, $z_2 \in [1.91, 2.19]$, and $z_3 \in [2.48, 2.61]$

E. $z_1 \in [-1.57, -1.33]$, $z_2 \in [0.32, 0.59]$, and $z_3 \in [1.78, 2.21]$

---

6. Factor the polynomial below completely, knowing that $x-5$ is a factor. Then, choose the intervals the zeros of the polynomial belong to, where

$z_1 \leq z_2 \leq z_3 \leq z_4$. *To make the problem easier, all zeros are between -5 and 5.*

$$f(x) = 10x^4 - 99x^3 + 308x^2 - 333x + 90$$

A. $z_1 \in [-5.14, -4.51]$, $z_2 \in [-3.1, -2.9]$, $z_3 \in [-2.91, -2.29]$, and $z_4 \in [-0.78, -0.64]$

B. $z_1 \in [0.57, 0.97]$, $z_2 \in [1.9, 3.4]$, $z_3 \in [2.25, 3.29]$, and $z_4 \in [4.93, 5.07]$

C. $z_1 \in [-5.14, -4.51]$, $z_2 \in [-3.1, -2.9]$, $z_3 \in [-1.97, -1.46]$, and $z_4 \in [-0.44, -0.38]$

D. $z_1 \in [-5.14, -4.51]$, $z_2 \in [-3.1, -2.9]$, $z_3 \in [-2.01, -1.57]$, and $z_4 \in [-0.3, -0.06]$

E. $z_1 \in [0.25, 0.54]$, $z_2 \in [0.4, 2.2]$, $z_3 \in [2.25, 3.29]$, and $z_4 \in [4.93, 5.07]$

---

7. Perform the division below. Then, find the intervals that correspond to the quotient in the form $ax^2 + bx + c$ and remainder r.

$$\frac{9x^3 + 39x^2 - 44}{x + 4}$$

A. $a \in [-39, -33], b \in [182, 186], c \in [-735, -729]$, and $r \in [2880, 2888]$.

B. $a \in [-39, -33], b \in [-106, -102], c \in [-420, -411]$, and $r \in [-1728, -1723]$.

C. $a \in [7, 16], b \in [-8, -5], c \in [28, 34]$, and $r \in [-196, -188]$.

D. $a \in [7, 16], b \in [71, 80], c \in [298, 307]$, and $r \in [1148, 1157]$.

E. $a \in [7, 16], b \in [0, 11], c \in [-14, -9]$, and $r \in [2, 10]$.

---

8. Factor the polynomial below completely. Then, choose the intervals the zeros of the polynomial belong to, where $z_1 \leq z_2 \leq z_3$. *To make the problem easier, all zeros are between -5 and 5.*

$$f(x) = 6x^3 - 19x^2 - 9x + 36$$

A. $z_1 \in [-1.96, -1.17]$, $z_2 \in [1.18, 1.64]$, and $z_3 \in [2, 3.4]$

B. $z_1 \in [-3.26, -2.9]$, $z_2 \in [-0.79, -0.65]$, and $z_3 \in [0.2, 0.8]$

C. $z_1 \in [-1.13, -0.74]$, $z_2 \in [0.49, 0.98]$, and $z_3 \in [2, 3.4]$

D. $z_1 \in [-3.26, -2.9]$, $z_2 \in [-0.57, -0.38]$, and $z_3 \in [3.7, 5]$

E. $z_1 \in [-3.26, -2.9]$, $z_2 \in [-1.57, -1.18]$, and $z_3 \in [1.2, 1.4]$

---

9. Perform the division below. Then, find the intervals that correspond to the quotient in the form $ax^2 + bx + c$ and remainder r.

$$\frac{20x^3 + 113x^2 + 142x + 42}{x + 4}$$

A. $a \in [15, 21]$, $b \in [29, 34]$, $c \in [9, 12]$, and $r \in [2, 3]$.

B. $a \in [15, 21]$, $b \in [191, 198]$, $c \in [907, 915]$, and $r \in [3697, 3699]$.

C. $a \in [-84, -78]$, $b \in [-207, -203]$, $c \in [-694, -681]$, and $r \in [-2708, -2700]$.

D. $a \in [15, 21]$, $b \in [10, 14]$, $c \in [73, 85]$, and $r \in [-347, -336]$.

E. $a \in [-84, -78]$, $b \in [429, 434]$, $c \in [-1591, -1588]$, and $r \in [6401, 6406]$.

---

10. What are the *possible Integer* roots of the polynomial below?

$$f(x) = 7x^4 + 2x^3 + 4x^2 + 3x + 5$$

A. $\pm 1, \pm 5$

B. All combinations of: $\dfrac{\pm 1, \pm 5}{\pm 1, \pm 7}$

C. $\pm 1, \pm 7$

D. All combinations of: $\dfrac{\pm 1, \pm 7}{\pm 1, \pm 5}$

E. There is no formula or theorem that tells us all possible Integer roots.
